

UNIT 7  
LINEAR EQUATIONS  
Day 1  
Solving Linear and Literal Equations

A LINEAR EQUATION is an equation in which the highest degree in a simplified form is 1. To solve a linear equation isolate the variable. A linear equation's graph would look like a line - hence the name linear.

## Types of linear equations:

### IDENTITY EQUATION:

Is true for all values of the variable.

Ex: 1)  $3x + 2 = 3x + 2$  TR  
2)  $5 = 5$   
3)  $2(x-5) = 5x - 10 - 3x$   
$$\begin{array}{rcl} \cancel{2x} - 10 & = & \cancel{2x} - 10 \\ - \cancel{2x} & & - \cancel{2x} \\ \hline -10 & = & -10 \end{array}$$
 TR

### CONDITIONAL EQUATION:

Is FALSE for at least one value of the variable.

Ex: 1)  $5x - 1 = 8$   
2)  $a = 3$   
3)  $2(x-5) = 9$

## CONTRADICTION EQUATION:

Is FALSE for all values of the variable.

Ex: 1)  $\cancel{5x} - 3 = \cancel{5x} + 1$

$-3 \neq 1$        $\emptyset$

2)  $7 \neq 3$

Equations that are equivalent have the same solution set:

examples:

$6x + 2 = 14$	$-4x - 9 = -17$
$x = 2$	$x = 2$

Therefore:  $6x + 2 = 14$  and  $-4x - 9 = -17$  are "equivalent"

1) Determine if the equations are equivalent

$$3x+1=7$$

$$3x=6$$

$$x=2$$

$$\frac{2(5x-7)=6}{2 \quad 2}$$

$$5x-7=3$$

$$5x=10$$

$$x=2$$

yes

Solve.

1)  $2y - (11y - 3) = 3[6(-y + 3) - y]$

$$2y - 11y + 3 = 3(-6y + 18 - y)$$

$$-9y + 3 = 3(-7y + 18)$$

$$-9y + 3 = -21y + 54$$

$$-3y + 1 = -7y + 18$$

$$4y = 17$$

$$y = \frac{17}{4}$$

$$2) \quad 24 \left[ \frac{7}{8}x - 2 = \frac{1}{3}x + \frac{5}{6} \right]$$

$$21x - 48 = 8x + 20$$

$$13x = 68$$

$$x = \frac{68}{13}$$

$$3) \quad 100 \left[ .07(x + 5) = .2x - .9 \right]$$

$$7(x + 5) = 20x - 90$$

$$7x + 35 = 20x - 90$$

$$-13x = -125$$

$$x = \frac{125}{13}$$

$$4) 100 \left[ \overset{10}{\cancel{2}} \cdot \overset{10}{(7x+1)} = .04 + x \right]$$

$$2(7x+10) = 4 + 100x$$

$$7x+10 = 2 + 50x$$

$$-43x = -8$$

$$x = \frac{8}{43}$$

5) Solve this linear rational equation

NOTE: Decide on Restrictions FIRST!

$$\frac{2}{x+3} = \frac{-5}{2x-1}$$

$$x \neq -3, x \neq \frac{1}{2}$$

$$4x - 2 = -5x - 15$$

$$9x = -13$$

$$x = \frac{-13}{9}$$

NOTE: Decide on Restrictions FIRST!

$$6) \cancel{(x-1)} \left( \frac{2x}{x-1} = \frac{6}{x-1} + 2 \right) \quad x \neq 1$$

$$\cancel{2x} = 6 + \cancel{2x} - 2$$

$$0 \neq 4$$

$$\emptyset$$

NOTE: Decide on Restrictions FIRST!

$$7) \cancel{(y-1)} \cancel{(y+8)} \left[ \frac{y-4}{y-1} - \frac{y+1}{y+8} = \frac{6}{y^2+7y-8} \right] \quad y \neq 1, -8$$

$$\downarrow$$
$$(\cancel{y-4})(\cancel{y+8}) - (\cancel{y+1})(\cancel{y-1}) = 6$$
$$\cancel{y^2} + 4y - 32 + (\cancel{y^2} + 1) = 6$$

$$4y - 31 = 6$$

$$4y = 37$$

$$y = 37/4$$

Literal Equation:

an algebraic equation that contains more than one type of variable.

Formula:

a literal equation that states a rule or principle.

Note: If the answer involve a rational expression, it is convention to express the answer as ONE rational expression.

1) Solve for a:

$$\begin{aligned}4a - 2 &= 3(2a - 5b) + 4b \\4a - 2 &= 6a - 15b + 4b \\4a - 2 &= 6a - 11b \\-2a &= -11b + 2 \\\frac{-2a}{-2} &= \frac{-11b + 2}{-2} \\a &= \frac{11b - 2}{2}\end{aligned}$$

\*\*\*\*\* DON'T FORGET RESTRICTIONS!!!!!!!!!!



2) Solve for x:

$$ax + bx = c$$

$$x(a+b) = c$$

$$x = \frac{c}{a+b} \quad a \neq -b$$

$$a+b \neq 0$$

$$a \neq -b$$

\*\*\*\*\* DON'T FORGET RESTRICTIONS!!!!!!!!!!

3) Solve for x:

$$ax - 5 = 3x + 2y$$


$$ax - 3x = 2y + 5$$

$$x(a-3) = 2y + 5$$

$$x = \frac{2y+5}{a-3} \quad a \neq 3$$

\*\*\*\*\* DON'T FORGET RESTRICTIONS!!!!!!!!!!

4) Solve for B:

$$A = \frac{1}{2}(B+b)h$$
$$2A = (B+b)h$$
$$\frac{2A}{h} = B+b$$

$$B = \frac{2A - bh}{h}$$
$$h \neq 0$$
$$B = \frac{2A}{h} - b$$

\*\*\*\*\* DON'T FORGET RESTRICTIONS!!!!!!!!!!

HOMEWORK  
Unit 7 Day 2  
Linear Equations Worksheet ODDS